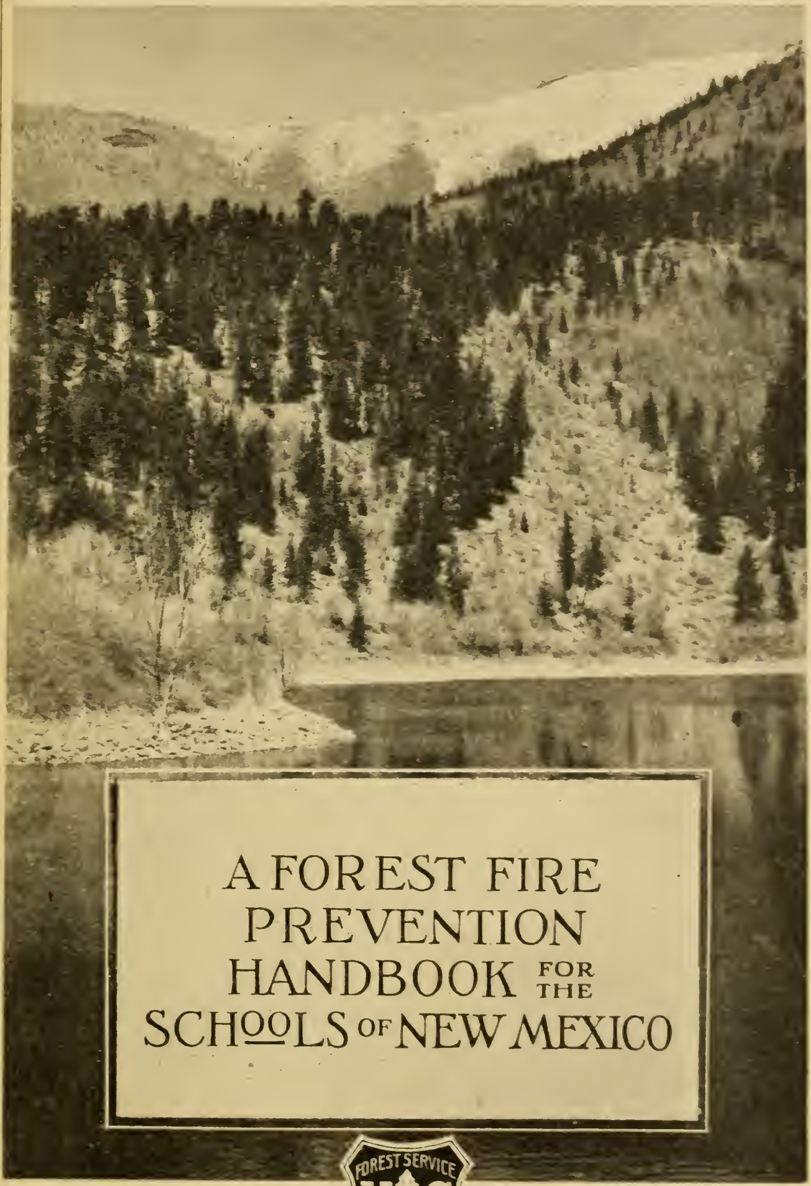
Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

UNITED STATES DEPARTMENT OF AGRICULTURE

MISCELLANEOUS CIRCULAR No. 89



A FOREST FIRE PREVENTION HANDBOOK FOR THE SCHOOLS OF NEW MEXICO

FOREWORD

To the Teachers of New Mexico:

Although the laws of the State of New Mexico do not make the teaching of fire prevention obligatory, I nevertheless feel it is the duty of a teacher, as a good citizen, to instill into the minds of the children under his or her charge the necessity for fire prevention in the forests as well as in the community.

New Mexico's marvelous forests are one of her greatest assets; teaching children the love of the forests and the necessity of conserving the forest resources is a great public need.

I therefore appeal to the teachers of New Mexico to give this matter attention during the school year and especially to emphasize it during American Forest Week.

Yours very truly,

Isabel Lancaster Eckles,
Superintendent of Public Instruction.

A FOREST FIRE PREVENTION HANDBOOK FOR THE SCHOOLS OF NEW MEXICO

Prepared by the Forest Service, Southwestern District, United States Department of Agriculture, in cooperation with the Superintendent of Public Instruction of the State of New Mexico. Issued March, 1927

INFORMATION FOR THE TEACHER

The United States uses more than two-fifths of all the wood consumed in the world. We consume each year about 200 cubic feet of wood for each man, woman, and child. The world average is about 30 cubic feet. Abundance of timber is one of the main things that have made this the most prosperous of all countries. If we are deprived of ample wood supplies, the effect will appear in poorer housing, harder living, and less profitable business.

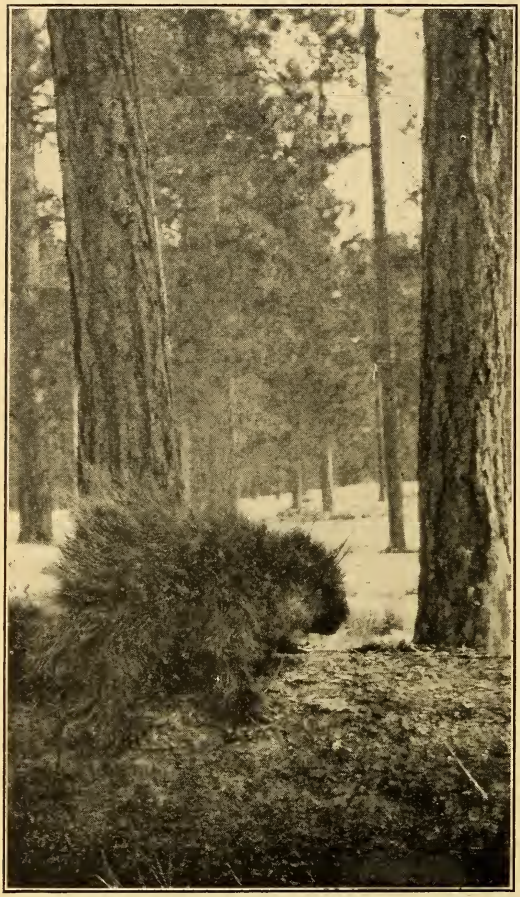
We have been able to use wood freely because of our immense stores of virgin timber and the development of our railroads, which have kept consumers in touch with the constantly retreating forests. As the virgin forests diminish the need for protecting our remaining timber and for keeping forest land productive becomes more and more urgent. Our consumption of timber is now four times as great as the replacement by growth. Not even so rich a country as the United States can afford to continue such a condition. We have more than 80,000,000 acres of forest land that is idle, producing practically nothing, and a much larger area only partially productive. To produce timber crops adequate to meet the needs of the Nation, all of America's forest land—470,000,000 acres—needs to be put to work and kept at work growing trees.

The greatest single enemy of the forest is fire. In the United States about 50,000 forest fires a year, on an average, sweep over an area of more than 10,000,000 acres and cause damage that runs up to $20,000,000 or more, exclusive of damage to young trees, watershed protection, and recreational and other resources which can not well be estimated in dollars and cents.

In the national forests of New Mexico, which include 8,482,315 acres, 3,496 forest fires occurred within the five-year period 1921–1925. These fires destroyed the timber on 91,636 acres, and to extinguish them cost over $171,000. No less than 1,400 of them were caused by the carelessness of individuals using the forests. And in most of these 1,400 cases, the teachers of the State will be interested to know, the responsible persons were residents of New Mexico and not tourists from other States. The public is coming more and more to realize the value of forests and the need for protecting them; and whereas 76 per cent of the fires on the New Mexico national forests in 1921 were due to human carelessness, in 1925 only 36 per cent were charged to this cause. The annual loss through preventable forest fires in the State is still much too large, however. Through further cooperative effort, it is believed, this loss can be greatly reduced. It is to help prevent such fires that this booklet is written.

LESSON NO. 1.—THE FORESTS OF NEW MEXICO

Before learning how forest fires start, how they are found and put out, and what damage they do, you will want to know where our forests are, and what is their value and their importance to the welfare of the State.



F-183332

Yellow-pine trees, porcupine in foreground

LOCATION AND AREA

Most of the higher mountains in New Mexico are timbered. The largest bodies of pine, fir, and spruce saw timber are in the Sangre de Cristo range east of Santa Fe and Taos, the Jemez Mountains in the northern part of the State, the Zuni Mountains southeast of Gallup, the Mogollon Mountains north and west of Silver City, and the Sacramento Mountains east of Alamogordo. These large areas from which lumber is cut cover about 5,000,000 acres. They all lie above 7,000 feet elevation, and the timber extends in most places to the very tops of the mountains. All around below the saw timber forests, and covering an area twice as large between 6,000 and 7,000 feet elevation, are the piñon and juniper stands, where cordwood, fence posts, and mine props are cut. Altogether nearly one-fifth of the State is timbered.

KINDS OF TREES

There are practically no forests below 6,000 feet elevation except the cottonwood groves along the Rio Grande and other streams. On leaving the valleys to go into the mountains, the first forests one finds are the piñon and juniper stands, sometimes called woodland forests. They are made up largely of piñon with scattered junipers of three different varieties. Above these come the western yellow pine forests, which are the most important in the State, for it is in these forests that most of the lumber is cut. Higher up in the mountains are the firs, spruces, and aspens.

AMOUNT OF TIMBER

The New Mexico saw timber forests contain over 17 billion board feet of timber, about two-thirds of which is owned by the Government and is located in six national forests and three Indian reservations. Of the remainder the State owns about one-half billion feet. Though the total looks large, it would, if cut into lumber, supply the United States for a period of only six months. The woodland forests, in which the trees are not tall enough nor straight enough to produce lumber, contain, according to the estimates, about 30,000,000 cords of wood. Large quantities of piñon nuts are collected annually from piñon trees that grow in these forests.

F-163904

Snow. Sangre de Cristo Mountains—from which comes water for irrigation

IMPORTANCE OF THE FORESTS OF NEW MEXICO

The forests of New Mexico produce about two-thirds of the lumber now used in the State, and if they are handled correctly and fires are kept from burning the young timber, these forests should be able to produce all the lumber the State now needs. They are also of great importance because of their production of railroad ties, mine props, fence posts, and cordwood.

In the openings where the trees do not stand so close together as to shade the ground too much, there is grass and other forage, which is used to fatten cattle and sheep. The livestock industry, which is the most important industry of the State, is dependent to a large extent upon these forest areas for range. About one-fifth of all the cattle and one-fourth of all the sheep in the State find summer range there, and some of them stay the year round.

The headwaters of nearly every important stream of the State rise in forested mountains, and the forests are of tremendous importance in conserving the water which falls in the form of snow and rain. The ground under the trees usually has on it a blanket of leaf mold and litter, which makes a reservoir that absorbs large quantities of water. It acts like a huge blotter and only after the ground and litter are full of water does the surplus begin to run off. The water which is held by the forest is later slowly released through springs and streams. In this way the run-off is more evenly distributed than if the forest did not exist. If these forests were entirely destroyed, the rain and snow water would run off very rapidly. The soil not being bound by the roots of the trees, much of it would be taken down with the resulting disastrous floods. This soil would settle in the irrigation reservoirs, where it would decrease their capacity and therefore their usefulness. By preventing this, the forests are, therefore, of great value in increasing the agricultural prosperity of the State.

Every summer many people go into the mountain forests from the surrounding valleys to rest and to get away from the heat. It is there that they can enjoy themselves in the cool, bracing air amid unexcelled mountain scenery. Trout in the streams and game in the woods make the forests attractive to fishermen, hunters, photographers, and all those who appreciate wild life.

QUESTIONS

1. Where are the forests of New Mexico?
2. How much of New Mexico is timbered?
3. What are the woodland forests and what products are obtained from them?
4. What forests of the State are the most important and why?
5. Name four important species of trees found in our forests.
6. How much timber do our forests contain and what part of this is owned by the Government? By the State? By private individuals?
7. Name three reasons why our forests are important.
8. How do the forests help the irrigated farms in the valley below them?

LESSON NO. 2.—FOREST FIRES—EFFECTS

Now that you have learned how important the forests of New Mexico are, you will want to know what needs to be done to protect them and why. This lesson is about forest fires and what they do in timber and brush.

Fires find many kinds of fuel in the forest. On the ground is a layer of needles, twigs, and bits of bark that have fallen from the trees, mixed with grass and weeds, all of it very dry and easily burned during the spring and fall dry season. Here and there is an old tree that has died and fallen to the ground. Perhaps there is a small open spot covered with brush and shrubs that burn easily. This is the kind of material that fire feeds on. Some people have thought that it would be a good thing to get rid of the litter on the forest floor by burning it at a safe season, simply because it can not be used for anything. All this litter, however, gradually decays and makes the trees grow better, just as fertilizers help to enrich gardens. Also this litter is the stuff that conserves the water and prevents erosion.

As the fire consumes this litter, it encounters many little trees, some in groups and some growing alone. These, because they are very tender and their needles are close to the ground, the fire kills. Even though the little trees can not be used now, much damage is done by burning them because after the big trees—the old ones—are cut to make lumber and other things for which wood is used, the little trees would keep on growing and in time make a second forest of big trees on the same land.

F-C497-A

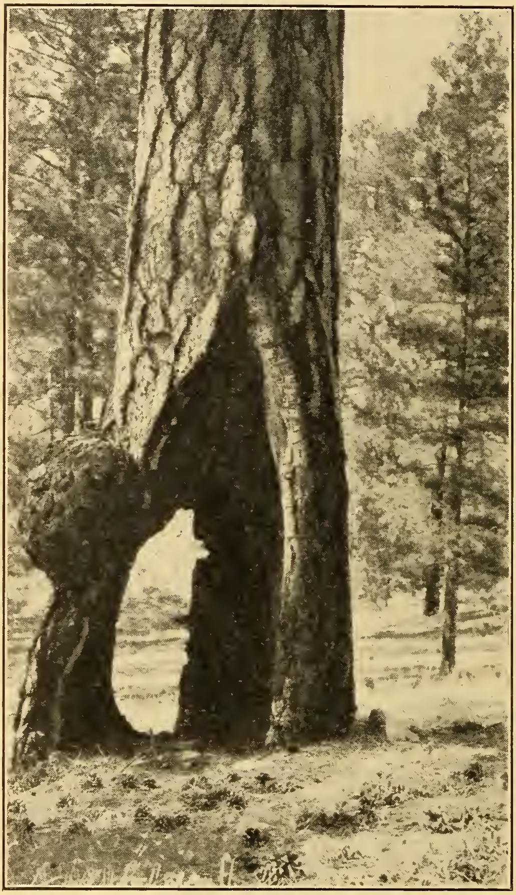
Effect of heavy fire on forests

Now what about the big trees? Many of them have already been burned near the ground so that some of the bark and wood is gone. Because for centuries there have been fires in the forest and gradually the wood has been burned away at the base of the trees, great ugly fire scars have been made. All over these scars, if the trees are pines or firs, pitch has been put out in an effort to heal the wounds.

The fire creeps through needles and twigs to the trunk of one of these trees with a fire scar, ignites the pitch, and sets the wood on fire. The tree may burn for hours until finally so much wood is burned out that the tree falls to the ground. There it lies and rots.

Maybe a little farther on the fire comes to a thick group of big trees, with lots of needles and twigs on the ground. Just then a puff of wind comes along and the fire, with so much fuel to burn, flames up to the tops of the trees, roars there a minute, and by that time has burned up all the needles. The trees then die, although the trunks stand there for years until finally they rot and fall.

So while the fire does not kill or injure all the big trees from which lumber comes, it burns down some of them and kills others with its heat and flames. On many it makes or increases the size of the fire scars and destroys much wood.



F-186171

Effect of repeated ground fires on a big pine

BRUSH FIRES

Throughout the timbered regions of the State there are many area where only an occasional large tree occurs. These areas are also largely covered with a dense stand of oak and other brush and, on the high mountain slopes, with aspen. If one looks closely, however, he will find pine, fir, and spruce seedlings which have not yet grown tall enough to show above the brush. These brush fields have usually been caused by old burns. Evidence of previous burns is very clear in the fragments of burnt wood and charred stumps which may still be found.

If a fire occurs in a brush area, it is not only very difficult to stop but also very destructive. When a wind is present, and there are usually winds with fires, the short and highly inflammable brush burns from the base to the top, forming what is commonly known as a crown fire. Such fires are very difficult to put out, as one can not approach close to them because of the intense heat. Usually they leave behind them nothing except a few charred stumps, loose rock, and impoverished soil.

With all the brush burned off, leaving the surface soil bare and unprotected, erosion will inevitably begin when the summer and fall rains occur, and immense quantities of silt and rocks will be washed into the adjacent streams, filling up the reservoirs and river channels and adding very greatly to the burdens of the farmer in the valley, who depends on these streams for irrigation. It is not unusual for flooded streams laden with material washed from the burned slopes to cover farm lands along the river valleys several feet deep with silt, rock, and gravel.

Furthermore, when the soil has been washed away from the mountain slopes, and the brush and young trees have been destroyed, it is very difficult to start a new growth of either brush or trees, as there is little loose soil or litter left for the young seedlings to take root in. Frequently it takes as much as 50 years before timber stands can be reestablished on such burns.

GRASS FIRES

Grass fires in the valleys and the mountain meadows do a great deal of damage by destroying grass which could otherwise be eaten by cattle and sheep. When these fires occur in the fall they are especially serious because much of the grass that is burned is needed for winter feed and at that time new grass does not grow to take its place.

QUESTIONS

1. What are the principal ways in which fires damage the forest?
2. Why should the small trees in the forest be protected against fire?
3. What is a fire scar?
4. Why are fires in brush areas damaging?
5. What damage do grass fires do?

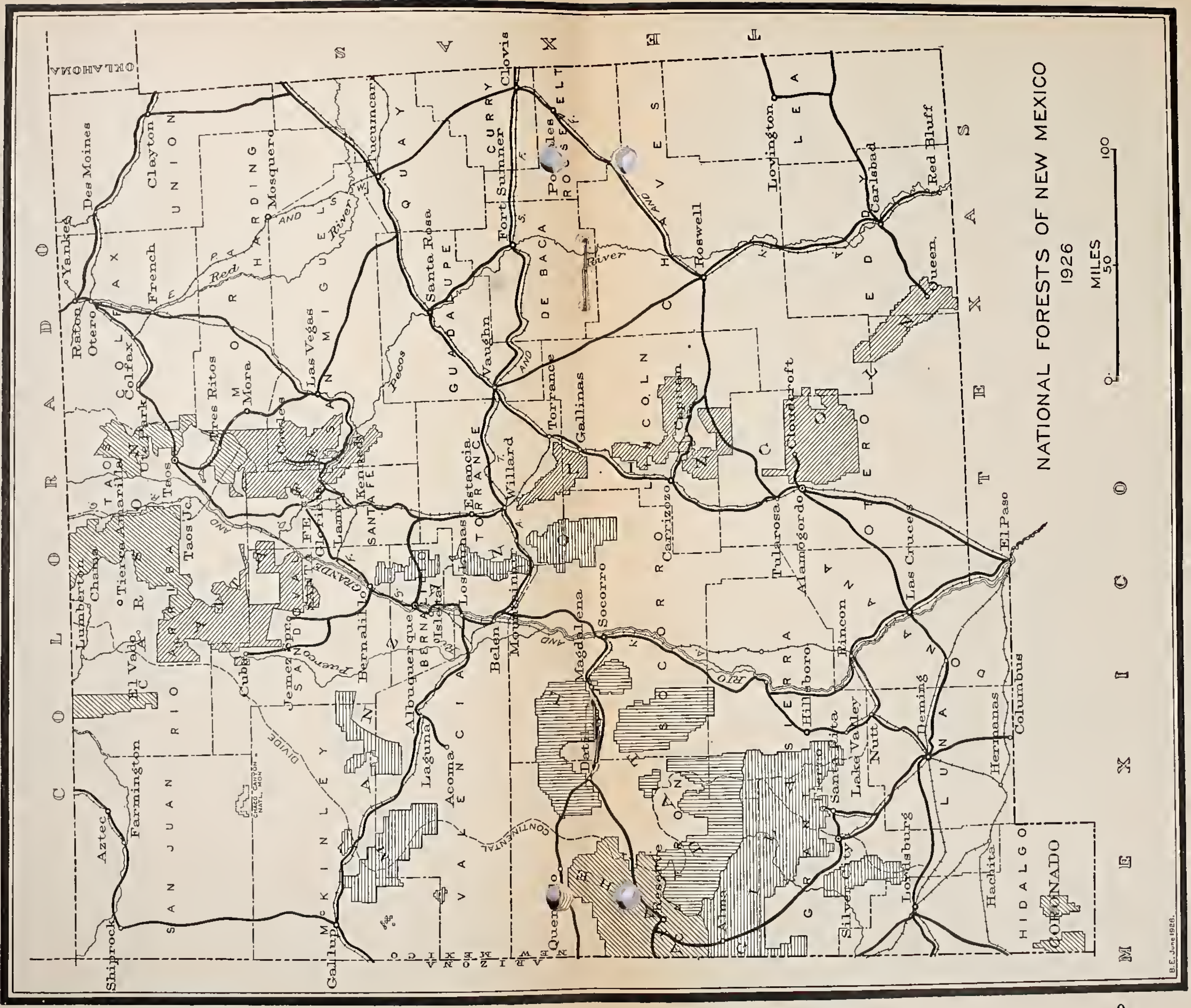
BURY YOUR CAMP FIRE WITH EARTH
BREAK YOUR LIGHTED MATCH IN TWO BEFORE DROPPING IT
BETTER STILL—DON'T DROP IT

LESSON NO. 3.—CAUSES OF FIRE

In the preceding lesson you have learned something of the serious damage which results from fires. You now naturally ask the question: "What causes these fires?"

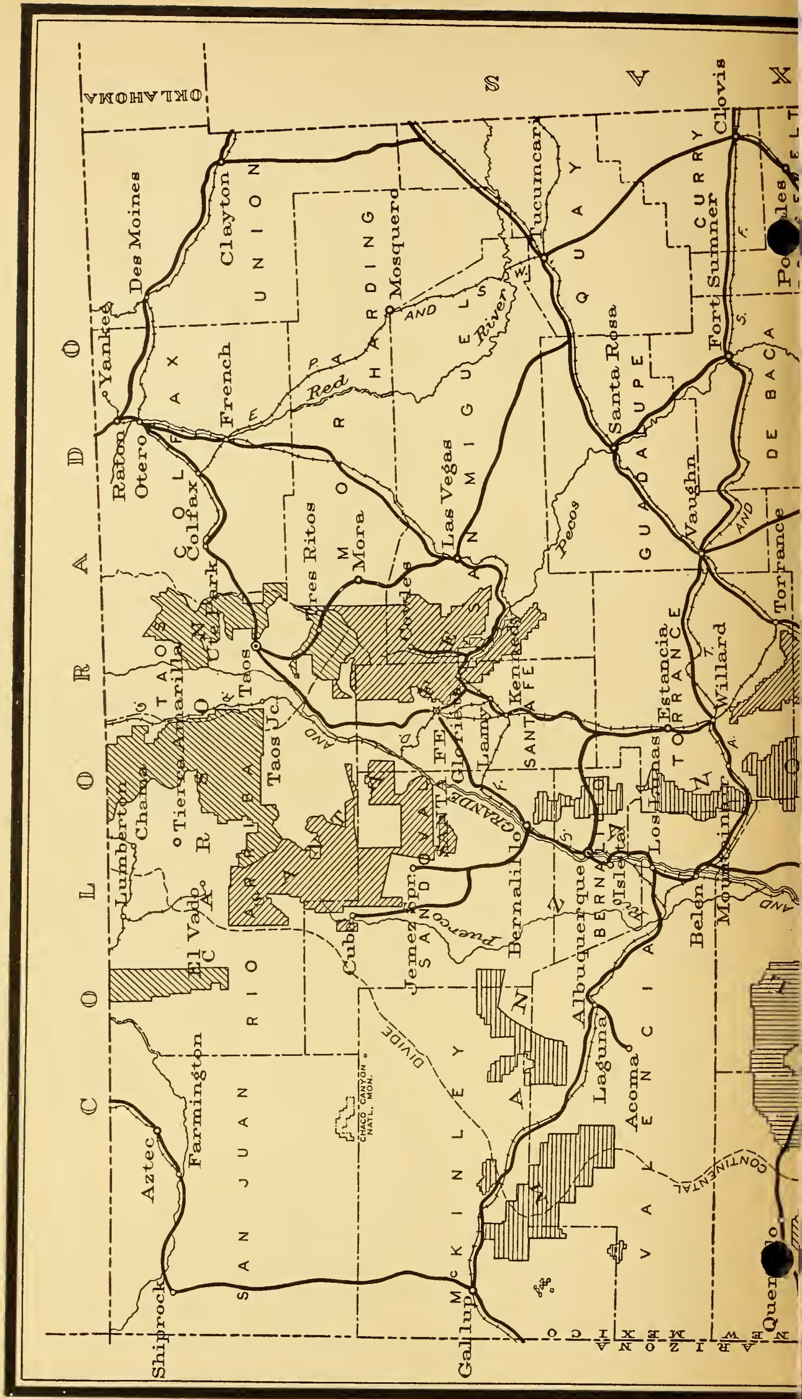
LIGHTNING FIRES

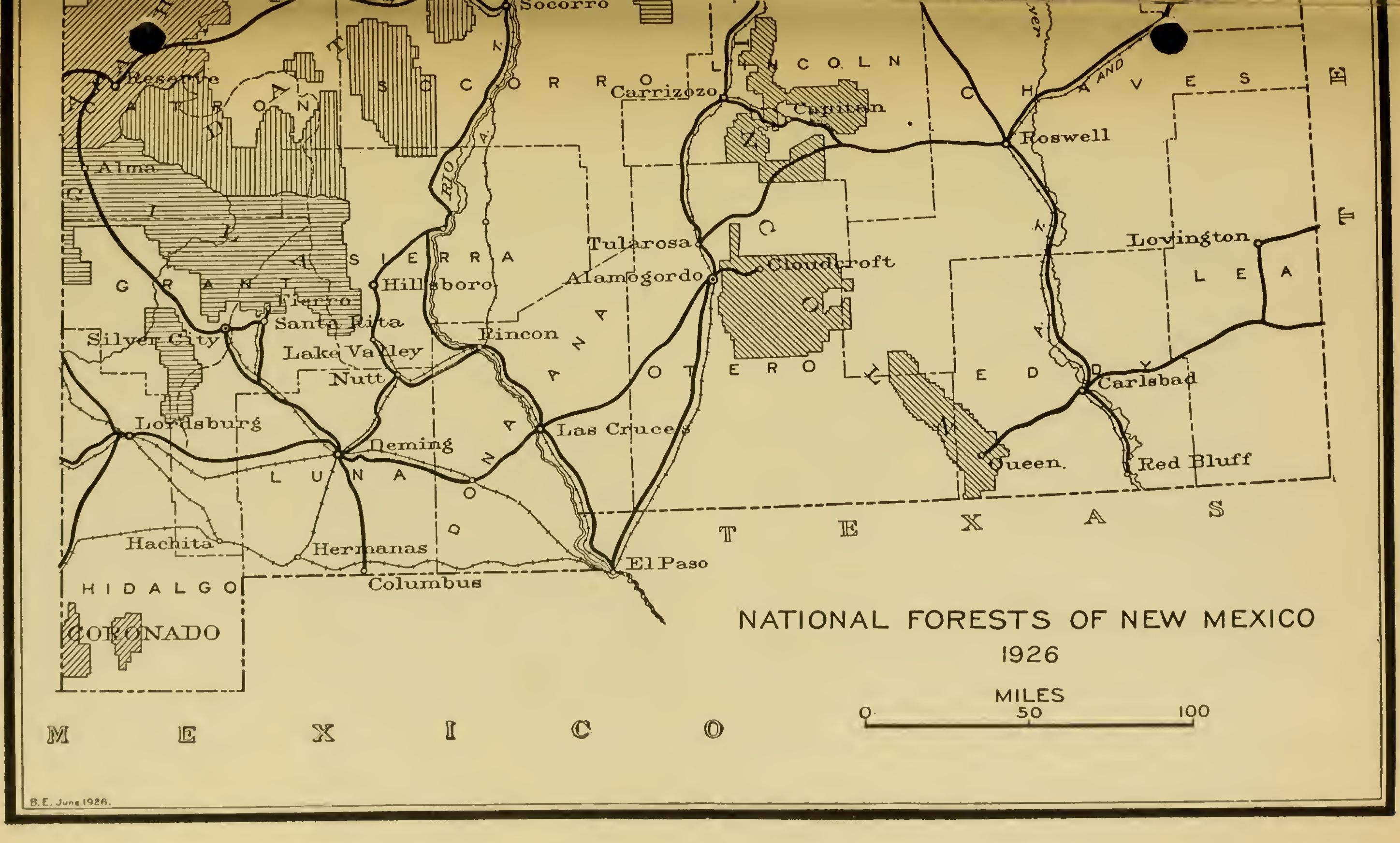
A natural cause of forest fires that is both common and destructive is lightning. Often, especially in June, there are lightning storms during which very little or no rain falls. Bolts of lightning strike trees, often ignite the wood, throw sparks into the surrounding litter, and start forest fires. Since these fires can not be prevented, the best that can be done is to keep a sharp lookout for them so that they can be put out before they grow large.



NATIONAL FORESTS OF NEW MEXICO

1926


COLORADO
OKLAHOMA
TEXAS
ARIZONA
Shiprock
Aztec
Farmington
Lumberton
Chama
El Vado
Tierra Amarilla
Taos Jc.
Taos
Ute Park
Colfax
Raton
Otero
Yankee
Des Moines
Clayton
French
Tres Ritos
Mora
Cowles
Las Vegas
Mosquero
Tucumcari
Santa Rosa
Fort Sumner
Clovis
Vaughn
Torrance
Willard
Estancia
Kennedy
Lamy
Glorieta
Santa Fe
Bernalillo
Jemez Springs
Cuba
Albuquerque
Isleta
Los Lunas
Belen
Mountainair
Laguna
Acoma
Gallup
Chaco Canyon Natl. Mon.
Continental Divide
Rio Grande
Red River
Pecos
Puerco
SAN JUAN
RIO ARRIBA
TAOS
COLFAX
UNION
MORA
HARDING
SAN MIGUEL
QUAY
CURRY
GUADALUPE
DE BACA
SANTA FE
SANDOVAL
McKINLEY
VALENCIA
BERNALILLO
TORRANCE
A. T. & S. F.

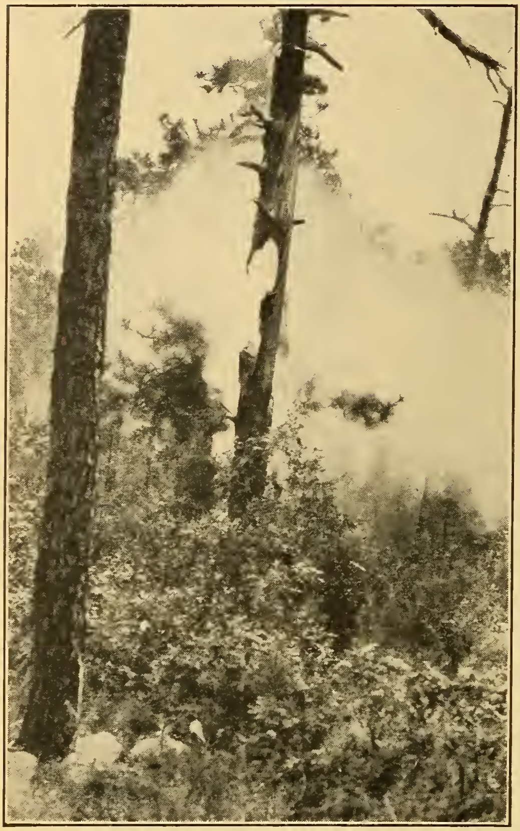

NATIONAL FORESTS OF NEW MEXICO
1926
MILES
0
50
100
Socorro
Carrizozo
Capitan
Roswell
Lovington
Tularosa
Alamogordo
Cloudcroft
Carlsbad
Queen.
Red Bluff
Reserve
Alma
Fierro
Santa Rita
Silver City
Hillsboro
Rincon
Lake Valley
Nutt
Lordsburg
Deming
Las Cruces
Hachita
Hermanas
Columbus
El Paso
CORONADO
S O C O R R O
L I N C O L N
C H A V E S
S I E R R A
G R A N T
O T E R O
D O Ñ A A N A
L U N A
E D D Y
L E A
H I D A L G O
RIO
T E X A S
M E X I C O
B.E. June 1926.

MAN-CAUSED FIRES

By far the most serious fires, however, are the result of carelessness or ignorance of human beings.

CAMP FIRES

Camp fires that are carelessly built or left unattended spread through the dry grass and litter and become forest or grass fires. They destroy timber and forage and spoil the beautiful camping places of the State. In the next lesson you will learn how you can build safe camp fires and what to do before going away from a camp fire.



A tree set on fire by lightning F-161395

SMOKERS

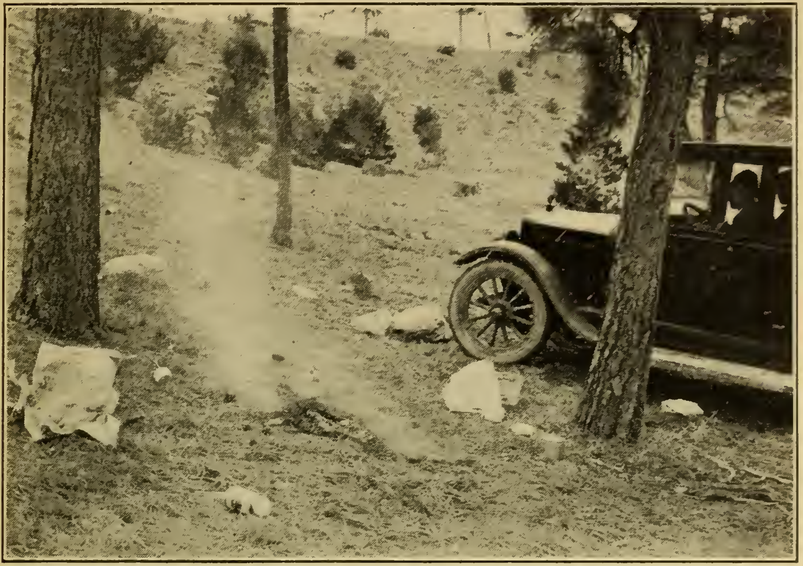
Careless hunters and fishermen who travel through the woods are responsible for many fires, which they start by throwing away lighted matches, pipe embers, or smoldering cigars or cigarettes. Smokers who travel by automobile are guilty of carelessly throwing aside lighted smoking materials that often fall into masses of dry pine needles or grass and flare into forest fires with the first wind.

INDUSTRIAL FIRES

In carrying on certain industries men find it necessary to use fire in the woods. Many fires result from the operation of railroad and logging engines and the clearing of land by ranchers. Sparks from engines can be prevented by the use of proper spark arresters on smokestacks. Ranchers can prevent fire escaping by using care and by burning brush and débris only when there is no danger that the fire will spread. It is best not to burn brush during May and June, or until the summer rains begin.

INCENDIARY FIRES

Malicious and criminal people sometimes start fires in the forest as well as in towns. Though their number is few, the fires they start often do much damage. It is the duty of every citizen to help the law officers run down those who willfully set fires and see that they are punished as they justly deserve.



F-185857

A camp fire built by a careless camper

QUESTIONS

1. Into what two general divisions can the causes of forest fires be divided?
2. How does man start forest fires?
3. How are forest fires started from camp fires?
4. How do smokers start forest fires?
5. When can brush be safely burned?

F-163261

Fires are sometimes started by steam skidder engines used in logging operations

PUT SMALL FOREST FIRES OUT—USE EARTH OR WATER

LESSON NO. 4.—FIRE PREVENTION

How can forest fires be prevented? If everyone who goes into the mountains would learn and follow the woodsman's rules in the handling of fires, a very large number of destructive blazes that now start from human carelessness would never take place.

HOW TO HANDLE AND PUT OUT CAMP FIRES

Remember a good woodsman builds a small camp fire well away from living trees, large logs, or green brush. He clears a place of all leaves, needles, grass and trash, digs a hole, and in the hole builds a quick small fire. When the fire burns down he sits beside it and does his cooking. The "tenderfoot" makes a bonfire and cooks himself while he smokes and burns his food.

F-185853

How a woodsman builds his camp fire—Out in an open cleared place

A good woodsman never builds a bonfire for cooking, and never for any purpose in windy weather or when there is the slightest chance that the fire will get away. He never leaves camp until he has put water on his fire, or has covered it with earth and knows for certain that it is entirely out. At the same time he cleans up and burns all refuse that has accumulated. In this way a woodsman leaves for the next person a camping place that is attractive and inviting.

HOW TO PREVENT SMOKERS' FIRES

A good woodsman makes sure that all matches and tobacco are out before he throws them away. He knows that the thoughtless tossing of a lighted match or cigarette into dry grass or litter may start a serious fire which may, besides destroying valuable timber, burn up some ranchman's house and barn.

HOW TO PREVENT INDUSTRIAL FIRES

A good woodsman sees to it that any machinery used in the woods, such as engines or tractors, is in such condition that sparks can not escape from the smokestack. A good woodsman does not burn brush when the country is very dry and windy. If he finds fires burning, he tries to put them out himself, but if he can not, he gets word to the nearest forest ranger as quickly as possible.

STATE AND FEDERAL FIRE LAWS

Both the State of New Mexico and the United States have passed laws which provide penalties for failure to handle fires in the way in which good woodsmen do. By this means those who are careless with fires may be taught how dangerous it is. The New Mexico law has penalties of from $25 to $500 or up to six months in jail for setting and leaving forest fires burning. People are told of these laws by signs which are tacked upon trees in many of the forests. Because they give this valuable information, the signs should not be mutilated or torn down.

F-186903

Campers in the forest

QUESTIONS

1. What kind of camp fires do good woodsmen build?
2. In what kind of a place do they build them?
3. What do they do with their camp fires and refuse before leaving?
4. How can smokers' fires be prevented?
5. Are there laws in New Mexico for the prevention of forest fires? What are the penalties?

EVERYBODY LOSES WHEN TIMBER BURNS

LESSON NO. 5.—HOW FIRES ARE DISCOVERED AND PUT OUT

In the previous lessons you have learned about our forests, why and how fires damage them, how fires are caused, and how they can be prevented. You will now want to know how fires may be discovered and put out if they do start.

In cities, towns, and other places of human habitation fires are usually discovered and the alarm is given as soon as they break out. In the mountains, however, there are extensive areas of our forests so thinly populated and with such obstructed views, because of mountain ranges and deep canyons, that fires may become very large before they are discovered if some special means of detection is not employed.

F-28023

Results of a camper's carelessness

LOOKOUTS

Careful watch is maintained over such forests by stationing men on the highest peaks to act as lookouts and by placing fire guards to patrol along ridges and other routes where they have a good view of areas in which fires are likely to occur. The lookout men go to their stations on the high mountain peaks in the spring and remain constantly on duty until the first summer rains occur. Food supplies are sent to them by the rangers. They occupy small buildings with windows on all sides—a "ribbon" of glass entirely around the building. These lookout men do not go to fires, but report them immediately by telephone to the rangers.

In addition, all people within or near the forests (miners, stockmen, hunters, campers, etc.) are constantly on the watch for fires and report them immediately to the forest rangers if help is needed in putting them out.

F-156722

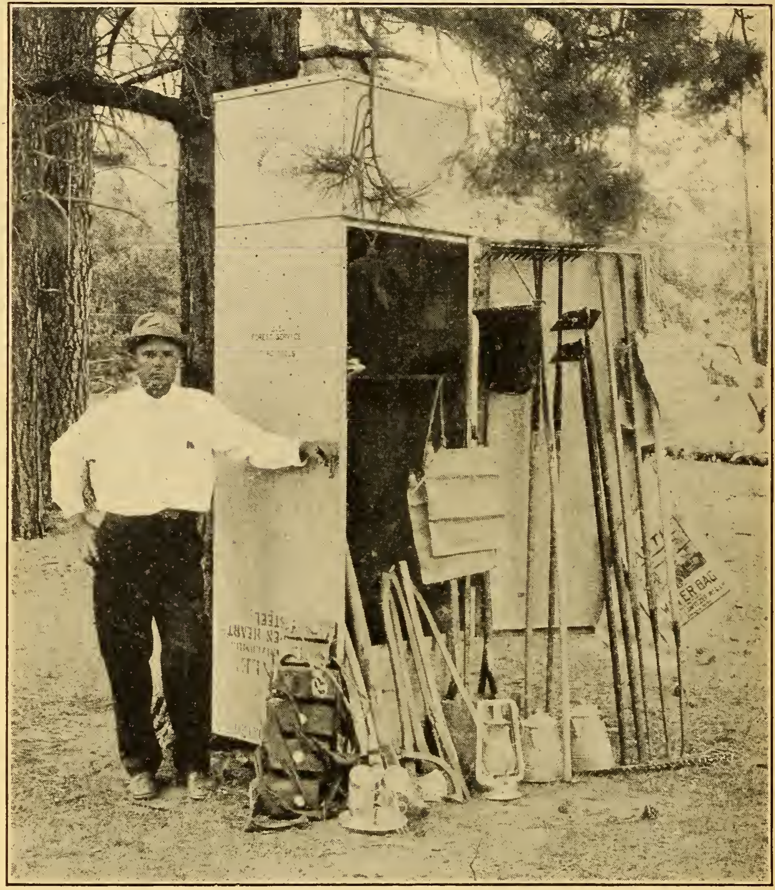
Forest Service lookout tower

TELEPHONE LINES

As you go through the mountains you will find that a very good system of telephone lines is maintained in order that reports may reach the rangers without delay. These telephone lines are somewhat different from those seen along country roads and in town as they are suspended usually from trees, instead of poles, by insulators attached to a short piece of wire.

RANGER STATIONS

Here and there throughout the mountains are ranger stations, which are the homes of the rangers and which are located at central points within their respective districts so that people can find them easily. During the spring dry season the rangers are assisted by guards, patrolmen, and firemen. Before the season opens the rangers see that there is an ample supply of fire-fighting equipment, well distributed to points where it will most likely be needed in case of fire. This equipment consists chiefly of axes, shovels, rakes, hoes, canteens, and cooking utensils. It must be kept in good condition and ready to use at any time, because a fire is likely to start at any moment. The rangers also have arrangements made with merchants, garagemen, ranchers, and employers of labor, so that when big fires are reported they can, on very short notice, get men for



F-23302-A

Fire tool box and tools

fire fighters, transport them to the fire line, and forward food supplies and equipment.

HOW FIRES ARE PUT OUT

The most important thing about fighting a forest fire is to get there as soon as possible and before it gets large. Then one or two men can generally handle it in a few hours. But if it is allowed to spread and there is a high wind, it may take a hundred or more men several days to get it under control. The men who fight it must, of course, be properly equipped with shovels, hoes, rakes, or other tools, and with food and water.

Small fires in grass and litter can often be beaten out with branches, sacks, or shovels. Larger ones, however, especially if burning fiercely in a high wind, are not so easily handled and it is usually necessary to clear a wide trail or fire line, which the flames can not cross, some distance in advance of the fire. In clearing this fire line, advantage is, of course, taken of open spaces which will permit the work to be done more rapidly and of ridges where the fires do not burn so fiercely. Sometimes back-firing is resorted to. This consists in building a fire along a road or trail or other favorable place where it can be properly controlled and allowing it to burn back to the main fire where they both go out for lack of further material to burn. A back-fire, however, if not carefully handled, is likely to get beyond control. It should be used only by experienced fire fighters. Fires burn very rapidly up hill but can frequently be stopped at the top of ridges. They die down during the night, which is the best time to bring them under control.

F-157429

Baldwin Ranger Station, Datil National Forest

WHAT YOU CAN DO TO PREVENT FOREST FIRES

Remember that it is the duty of every one who goes into the woods, whether on business or pleasure, to be extremely careful not to start fires and to help put them out if they do start. You can help tremendously to prevent fires by following the example set by experienced woodsmen in the handling of camp and other fires in the forests. Furthermore, you can make it a point to influence others to do the same. If you discover a fire, put it out if it is small; but if you can not control it, notify the nearest forest ranger. If you do put out a forest fire, be sure that no embers remain to start up again.

QUESTIONS

1. Name three ways in which fires are located.
2. What would you do if you discovered a small fire? A large one?
3. How would you extinguish a small grass fire?
4. What is meant by back-firing?
5. How can you help to prevent forest fires?

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
10 CENTS PER COPY
▽